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IMAGE PROCESSING MODEL BASED E-LEARNING FOR STUDENTS AUTHENTICATION

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Image processing model based E-Learning for students authentication (Conference Paper)

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Abstract

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E-Learning in the Indonesian education community has been growing positively as an electronic information technology application through an internet network designed for the benefit of learning. But it still raises some obstacles in the implementation, as it relates to equity and access. In another aspect, e-learning also contains major weaknesses, namely the decrease in the frequency of direct contact between learners and between students with lecturers and other learning resources, so that learning does not experience completeness in all aspects of cognitive and non-cognitive. The weakness is also accompanied by the suspicion of the institution to the honesty of learners in carrying out the learning process. This study aims at building an e-learning model that can bring the intensity and

capacity of learners actually through the virtual world through self-assessment based on image processing. The proposed steps are break into several parts: create a dataset of faces that can be used to evaluate given algorithm. Subsequently the enhancement using histogram equalization allows a strong enhancement on facial features. In addition, then the feature descriptor are selected using Viola and Jones [1]. Afterwards, those features will be saved to database. The next step is to build the system than allows the online learners are detected through our image processing approach then all the interaction will be verified using our proposed infrastructure. The results of the study: (a) Image Processing Based E-Learning model was built with a system capable of running in existing infrastructure so far, and (b) Image Processing Based E-Learning model proved valid and reliable both substantially, system and feasibility significant. The results of this study have implications that can be tested on a larger scale that is for some courses and in a particular department. © 2017 IEEE.

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***Abstract*—E-Learning in the Indonesian education community has been growing positively as an electronic information technology application through an internet network designed for the benefit of learning. But it still raises some obstacles in the implementation, as it relates to equity and access. In another aspect, e-learning also contains major weaknesses, namely the decrease in the frequency of direct contact between learners and between students with lecturers and other learning resources, so that learning does not experience completeness in all aspects of cognitive and non-cognitive. The weakness is also accompanied by the suspicion of the institution to the honesty of learners in carrying out the learning process. This study aims at building an e-learning model that can bring the intensity and capacity of learners actually through the virtual world through self-assessment based on image processing. The proposed steps are break into several parts: create a dataset of faces that can be used to evaluate given algorithm. Subsequently the enhancement using histogram equalization allows a strong enhancement on facial features. In addition, then the feature descriptor are selected using Viola and Jones [1]. Afterwards, those features will be saved to database. The next step is to build the system than allows the online learners are detected through our image processing approach then all the interaction will be verified using our proposed infrastructure. The results of the study: (a) Image Processing Based E-Learning model was built with a system capable of running in existing infrastructure so far, and (b) Image Processing Based E-Learning model proved valid and reliable both substantially, system and feasibility significant. The results of this study have implications that can be tested on a larger scale that is for some courses and in a particular department.**

***Keywords*—E-Learning; Image Processing; Mastery Learning**

I. INTRODUCTION

E-learning has become an increasingly important mode of learning and teaching in the last few decades and has become an efficient and effective learning method. The growing number of internet users with smart phones and tablets worldwide has supported the deployment of e-learning, not only in higher education and vocational training and also in new language schools [2].

In addition, according to Sahid et al., Learning Management System (LMS) becomes more accessible to provide a virtual learning environment. The rapid and ubiquitous technological developments led to the rapid development and improvement of LMS [3]. Tavangarian et al. states that E-Learning is a structured distance learning system, besides E-Learning also provides experience and understanding during the learning process of the individual so that they gain knowledge and benefits of the system [4, 5].

Sharp et al. states that "To design an interactive product we need to pay attention to the experience of the users as well as consider the wishes of the users so that we can create a product containing content that is interesting and well liked by the user without reducing the value of the function and purpose of the product" [6]. The use of E-Learning is one effective solution for those who have limited space and time but still want to keep learning. However, for the problem of access is still not certain of its honesty because user authentication usually only use incoming credentials. Thus, learners have the opportunity to cheat [7].

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In the implementation of E-learning found several weaknesses, among them is the decrease of direct contact frequency among fellow learners and between learners with lecturers and other learning resources, so that learning does not experience complete in all aspects both cognitive and non- cognitive. The weakness is also accompanied by the suspicion of the institution to the honesty of learners in carrying out the learning process.

In previous research conducted by Kawamata et al. on spoofing detection by improving user authentication through facial authentication procedures that are updated regularly. The face update is based on the sum of the facial features gradation at the student's operating time [7]. Furthermore, in this study aims at building an E-Learning model that is able to present the intensity and capacity of learners actually through the virtual world through self-assessment based image processing. Facial Recognition System is done using webcam during e-Learning takes place. Image Processing is done to identify and identify students. The proposed steps are break into several parts: create a dataset of faces that can be used to evaluate given algorithm. Subsequently the enhancement using histogram equalization allows a strong enhancement on facial features. In addition, then the feature descriptor is selected using Viola and Jones [1].

II. Literature Review

A. Learning Content

Online learning content refers to the content of a learning program [8]. According to Barker, the design of online learning should be of a similar class format in terms of course description, objectives, learning content, objectives, scope and evaluation [9]. Media without content is powerless. He then emphasized that a message should be adjusted to the delivery method. Some media are better suited for conveying specific information 8.

Furthermore, he suggested that the interaction and communi- cation of instructor-to-student and vice versa should be carefully considered in designing and developing learning content. In the Indonesian context, Soekartawi found that problems in designing, developing, and managing an online learning program still exist [10]. Empirical studies by Hussein et al. show it. The design and layout of e-learning management system is very influential on students' ability. The acceptance of online learning in Indonesia Thus the well designed e-learning content can make easier to learn online and increase the motivation in order to use e- Learning tool [11, 12].

III. Assessing Motivation in E-Learning

As explained earlier, we believe that the state motivates learners through assessing issues. It is very important to develop a successful e-learning learning environment, but to do this is not easy. Thus, most research in the field of e-learning can be easily processed by e-learning systems [13].

Up to now the motivation in e-Learning has been seen put forward as a matter of design. In other words, proper instructional design and appropriate learning tivities will in- volve all learners [14]. While designing a motiva g e-learning environment is important, getting stu ts motivated for the entire learning period is one of e biggest challenges. Not only in e-learning, but also in all forms of learning. However, while in traditional ce-to-face learning and synchronous e- learning learning, teachers have direct contact with learners, so as to analyze the overall behavior of learners and thus be able to deduce their motivational circumstances. But in the context of detection of asynchronous e-learning motivation (eg WBEL) is a more challenging process [15]. Information about student motivational circumstances will enable content adjustment and improve the motivation of learners.

A. Building Character through Interactive Media

The ability to think critically, creatively, innovatively, curios- ity, science and technology oriented and reflective will be an excellent character development. Interactive media designed to build critical thinking skills and creative students. In addition, interactive media should be able to obey the rules governors who asked the rules and interactive media should be tailored to the needs of users and can also be used as one of the containers to create a good cultural climate so that students are able to solve problems both individually and in groups so that can be built cooperation through the media [16].

B. Image Processing

Image processing is a form of digital signal processing where the input used is an image, can be a photo or video. The output of image processing is a set of features extracted from the image to further enhance its quality. Most image processing techniques involve handling images as two-dimensional signals and applying standard signal processing techniques to it [17]. The purpose of image processing is needed to provide a significant output in accordance with the specific needs.

IV. Assessing Motivation in E-Learning

The research method used is neuro-research. This method presents a unification effort between quantitative and qualitative methods through three stages of research. The first stage is the exploratory research stage that is in the form

of building awake Image Processing Based E-Learning. At this stage also involves 3 (three) IT experts for model approval with Delphi Technique. The following steps are considered to be a road map while capturing

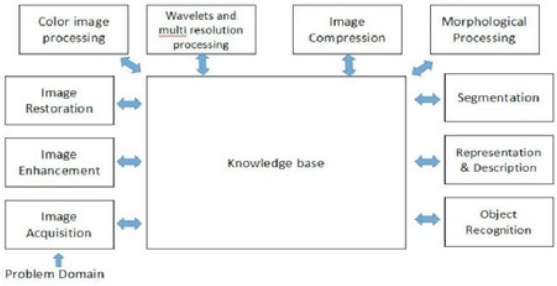

Fig. 1. Fundamental Step in Digital Image Processing

images / video processing algorithms to a real-time environment that runs on a hardware platform [18]:

- Step 1 :Understand the algorithm

  The selection of appropriate algorithms can support an efficient real-time calculation process in hardware selection and is also effective in executing assigned tasks with a high degree of accuracy.

- Step 2: Multiplatform implementation

  Selection of targeted programming language can help the implementation process easier. Several existing pro- gramming languages, have tools that can be used to convert existing algorithms to code in other program- ming languages. In this case MATLAB or LabView supports the code conversion into C language. This is necessary, because the possibility to build a system using a combination of several different hardware requires an interface that can integrate the entire system.

- Step 3: Understand the hardware

  An understanding of the hardware architecture used can improve the computation and capabilities of the built architecture.

- Step 4: Port of the reference algorithm to the target hardware

  This step involves a port reference algorithm to the target hardware platform.

- Step 5: Apply high-level memory and software optimiza- tion

  The implementation of each module should be followed by the code re-engineering task that makes it possible to find the same function that may occurred in another module.

- Step 6: Test

  The validation method has to be robust and prevent the over-fitting result that leads to unreliable high accuracy rate. In addition, the reliability of the system is validated through some scenarios in order to find the point that needs to be aware of.

V. Proposed System

A. Pre-Processing

In the initial stage, the process will be done is to build a dataset consisting of a collection of photos of the students who will be used as the master of the database authentication. By using this dataset, a pre-processing step in order to allow a strong enhancement of the Region of Interest in the image. The enhancement using histogram equalization approach can enhance facial features.

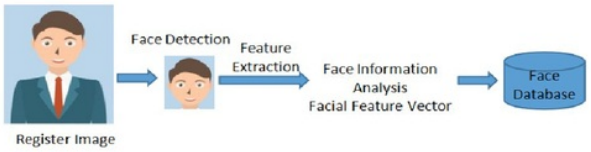

Fig. 2. Building Face Image Database

B. Face Detection

Face detection consists of finding texture patterns in images that tend to be faces. Face authentication method should be done in during e-Learning at any time. Thus, face authentication Algorithms should be sufficient to perform in real time using Viola & Jones methods [1, 7]. The main features of this algorithm are the speed at which the face is processed (detected), even on different scales. Uses sub windows of Various sizes that slide through the image [19, 20].

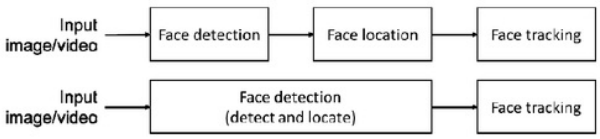

Fig. 3. Face Detection Process de Carrera [20]

C. Feature Extraction and Feature Recognition

Fig. 4. A Generic Face Recognition System de Carrera [20]

Face detection is a process of identifying the face taken from a place in a certain time by digging information obtained from the input image. This procedure has many applications such as face tracking, pose estimation or compression.

The next step - feature extraction - involves getting faces with relevant features from the data This feature may be the face of a particular area, variation, angle or size, which can be relevant to humans (eg eye distance).

In a Task identification, the system will report the iden- tity of the database. This phase involves comparison methods, classification algorithms and measurements. This phase uses a method commonly performed in other areas that also perform the classification process - techniques. We can find a variety of approach techniques for recognizing faces by combining or adding certain techniques.

D. *Image Processing Algorithm Based E-learning*

The algorithm used in face recognition and authentication systems is using template matching. The template matching process uses pixels, samples, models or textures as a pattern. The recognition function is used to calculate the differences between the features of the image input and the stored template. From the existing database face will then be matched with the image input obtained from the webcam when the e-Learning system is in progress.

E. *System Architecture*

Implementation of the Image Processing model in E-Learning is used as a continuous user authentication to identify the existence of learners during the e-Learning process. The facial recognition technology using Image Processing operates by scanning the person's face and matching it with images stored on existing databases in the system.

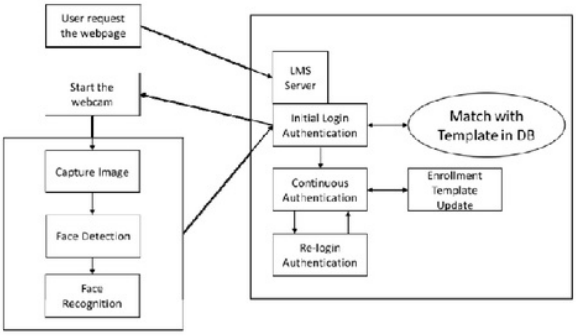

Fig 5. System Architecture

The following is the stage of the Image Processing Model based on E-Learning after the user entered the Learning Man- agement System.

The system will request Login Authentication Beginning In addition to being asked to enter a username and password. System also asks the user to activate the live camera so that the system can scan and detect faces. The facial recognition system integrates with the LMS (Learning Management System) to identify and verify learners in accessing E-Learning and to continue validating learners' identities out of the learning session. Face representations are counted and stored as attendance registration templates.

- Continuous Authentication
  Continuous authentication starts after. The system con- tinues to authenticate users periodically (2 seconds). At any time the system will validate again. The first step used is the method of installation, that is with knowledge-based methods, learning methods, methods. The second step is to do several approaches to the model and eliminate face image directly, matching elas- tic graphics, artificial neural networks, major component analysis (PCA), and multiresolution 21,20. During the examination period, if not. Will not be present again in front of the screen, then the system will update on.

- Update Registration
  Templates In this process the system will re-validate to reduce errors in detection caused by changes in illumination. This process consists of two stages.

  1) Illumination change detection: The system will detect the threshold of similarity in advanced authentication. If the resemblance feels below the threshold then the system will check whether the user is still in front of the screen or there is a change of lighting in the area around.
  2) Update the registration template: When the illu- mination change is detected, the user presence template will be updated.

- Relogin Authentication
  When the system finds that the user is no longer in front of the screen then the system will go into Relogin Au- thentication Status mode. In this mode the system will be locked and request re-authentication and user detection automatically. If the detection process is successful and the user is acknowledged as the owner of the account, then the status switches to the Continuing Authentication process again. However, if found any differences in the process of face recognition, then the system will enter the re-Login process.

VI. Discussion

Suggestions for further research that can be given further consideration is to improve the method of face recognition so as to improve accuracy in the

development of the Image Processing model based on E-Learning.

VII. Conclusion

The image processing attempts to extract information from the outside world through its visual appearance. Therefore the information should be given on the processing algorithm with video input hardware. With the development of e-Learning model using image processing is expected to be able to increase authentication of learners by means of learning with e-Learning can be maximized.

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